TEMPO: Determining, Combining, and Predicting Earth orientation Parameters for Spacecraft Navigation

R S Gross, D 11 Boggs, J O Dickey, S H Oliveau, '1' F Runge, and J A Steppe (Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena, CA 91 109; pb. 818-354-4010; fax: 818-393-6890; email: rsg@logos.jpl.nasa.gov)

In support of spacecraft tracking and navigation at the Jet l'repulsion Laboratory (JPl .), Earth orientation measurements are currently acquired, processed, and delivered [wice.-pcr-wcck to the J])], navigation teams by the Time and Earth Motion l'recision Observations ('I'IiMl'[)) project. Because the Earth's orientation changes rapidly and unpredictably, measu rements must be acqui red frequently and processed rapidly in order to meet the near-real-time Earth orientation calibration requirements of the navigation teams. These requirements are currently met by using the 70-meter (DSN) radio telescopes to conduct twice-pcr-wmk very long baseline interferometry (VI .131) measurement sessions. After the VI .BI data are processed to determine the baseline variation-of-latitude and UT0 components of the Earth's orientation, the Kalman Earth Orientation Filter (KEOF) is used to combine the most recent TEMPO VLBI measurement with past measurements and other publicly available, but less timely, Earth orientation measurements in order to generate and deliver the Earth orientation calibrations (polar motion and U-i'1) required by tile. navigation teams.

Deep Space Network

In the near future, the Global Positioning System (GPS) will be used to provide daily determinations of polar motion and length-of-day within 24 hours of acquisition. TEMPO VI .BI measurement sessions Wiii still be conducted, although less frequently and using just the 34-meter telescopes of the DSN, in order to provide the benchmark universal time measurements between which the GPS length-of-day measurements wiii be integrated. The KEOF will be used to Combine the GPS polar motion and length-of-day measurements with the TEMPO VI .BI variation-of-latitude and UT0 measurements, along with other publicly available Earth orientation measurements, in order to ge nerate and deliver the required polar motion and UT1 calibrations.